(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号

特開平10－239517

(43)公開日　平成10年(1998)９月11日

(51)Int.Cl.⁶		識別記号	FI		
Ｇ０２Ｂ	5/22		Ｇ０２Ｂ	5/22	
Ａ６１Ｂ	1/00	３００	Ａ６１Ｂ	1/00	３００Ｔ
Ｇ０２Ｂ	5/28		Ｇ０２Ｂ	5/28	
	23/24			23/24	Ａ

審査請求　未請求　請求項の数４　ＯＬ　（全７頁）

(21)出願番号　特願平9－48152

(22)出願日　平成９年(1997)３月３日

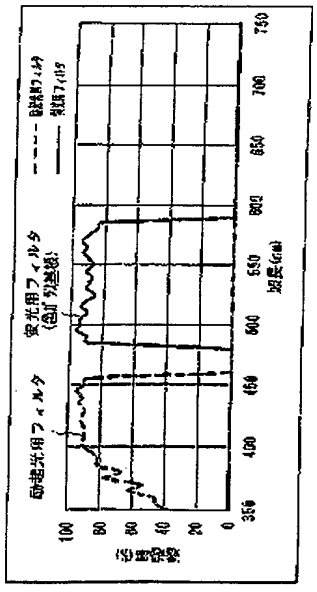
(71)出願人　000000527
旭光学工業株式会社
東京都板橋区前野町２丁目36番９号

(72)発明者　宇津井　晉也
東京都板橋区前野町２丁目36番９号　旭光学工業株式会社内

(74)代理人　弁理士　逢山　勉　（外４名）

(54)【発明の名称】　光学フィルタ及び蛍光観察内視鏡装置

(57)【要約】
【課題】基板に形成する膜層を少なくしても適正な波長領域の光のみを透過させる光学フィルタを提供すること。
【解決手段】本発明による蛍光用フィルタ３５は、４００nm程度の光より短い波長領域の光を透過しない色ガラス基板の両面に蒸着膜を形成することによって作製されている。このため、従来の白板ガラス基板を用いた蛍光用フィルタが透過させてしまう３７０nmの光より短い波長領域の光を遮光できる。従って、蛍光用フィルタ３５を使用した蛍光観察内視鏡装置では、蛍光用フィルタ３５が撮像部３０に導入された光のうち蛍光成分のみを透過し励起光成分を遮光する。従って、蛍光成分のみからなる生体の像がＣＣＤカメラ４１によって撮像されるため、モニタ５０には適正な生体の蛍光観察像が表示される。



* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] The light filter characterized by the bird clapper from the wavelength-selection transparency membrane layer which is the light filter which makes only the light of a predetermined wavelength field penetrate, and is formed at least in one side of the colored glass which makes a substrate, and the aforementioned colored glass.
[Claim 2] The light filter according to claim 1 with which light of the aforementioned predetermined wavelength field is characterized by being the light of a 480nm - 590nm wavelength field.
[Claim 3] The light filter according to claim 1 with which the aforementioned colored glass is characterized by having the property which does not penetrate light with a wavelength of less than 400nm.
[Claim 4] It is arranged in the lighting optical path between the body tissues which serve as a light source lamp which is characterized by providing the following, and which is made to generate lighting light, and a photographic subject. It is arranged in the observation optical path between the observation sections for observing the filter for excitation light which penetrates only the excitation light of wavelength which generates fluorescence from the aforementioned body tissue among the aforementioned lighting light, and the aforementioned body tissue and its image. Fluorescence observation endoscope equipment which has the filter for fluorescence which shades the aforementioned excitation light and penetrates the aforementioned fluorescence. Colored glass to which the aforementioned filter for excitation light and/or the aforementioned filter for fluorescence make a substrate. The wavelength-selection transparency membrane layer formed at least in one side of the aforementioned colored glass.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the light filter which makes only the light of a predetermined wavelength field penetrate, and the fluorescence observation endoscope equipment using the light filter.
[0002]
[Description of the Prior Art] Generally, fluorescence observation endoscope equipment consists of lighting optical system for irradiating the excitation light of specific wavelength at the body tissue as a photographic subject, and observation optical system for observing the fluorescence emitted from the body tissue excited by this excitation light. This lighting optical system is equipped with the light source lamp and the filter for excitation light which penetrates only excitation light among the lighting light injected from this light source lamp. Moreover, observation optical system is equipped with the filter for fluorescence which penetrates only the fluorescence generated from a body tissue and is led to the observation section while cutting excitation light. The fluorescence emitted from a body tissue is compared with excitation light, and is a very feeble light. Therefore, in order to prevent the invasion of the excitation light by the side of the observation section from which fluorescence observation becomes difficult in production with the above-mentioned filter for excitation light and the above-mentioned filter for fluorescence, it is necessary to produce both filters so that the transmitted wave length field of the filter for excitation light and the transmitted wave length fields of the filter for fluorescence may not overlap.
[0003] The conventional filter for excitation light and the conventional filter for fluorescence were produced by forming a vacuum evaporationo film in the heat-resistant white-board glass which makes a substrate. for example, the filter for fluorescence was produced by forming the vacuum evaporationo film which consists of a film on which two kinds of several said layers matter which the white-board glass substrate boiled on the other hand, and was described above was put mostly by turns while forming the vacuum evaporationo film which consists of a film which put by turns about 50 layers of two kinds of matter which has a mutually different refractive index on one side of a white-board glass substrate Moreover, it was produced when the filter for excitation light also formed a vacuum evaporationo film for two matter with which refractive indexes differ to both sides of a white-board glass substrate in piles by turns, respectively.
[0004]
[Problem(s) to be Solved by the Invention] However, there were the following problems in the conventional filter for excitation light and the conventional filter for fluorescence. Drawing 5 is a graph which shows the part light-transmission property of the filter for excitation light produced by the method mentioned above, and the filter for fluorescence. As shown in drawing 5 , the filter for excitation light penetrates only the light of a wavelength field shorter than about 460nm light. On the other hand, the filter for fluorescence will also penetrate the light of a wavelength field shorter than about 370nm [besides the light of a 480nm - about 585nm wavelength field] light.
[0005] Thus, the light of a wavelength field shorter than the about 370nm light which penetrated the filter for excitation light had also made the conventional filter for fluorescence penetrate. That is, it had had the field where the transparency field of the filter for excitation light and the transmitted wave length fields of the filter for fluorescence overlap. Therefore, when it was used for the fluorescence observation endoscope equipment which mentioned above these filters for excitation light, and the filter for fluorescence, the excitation light irradiated by the body tissue penetrated the filter for fluorescence, it invaded into the observation section side, and there was a possibility that fluorescence observation might become difficult.
[0006] If it forms by the number of layers with more 20-30 layers than the number of layers which described above the vacuum evaporationo film of for example, the filter for fluorescence, since the transmitted wave length field of the filter for fluorescence can be made into a 480nm - about 585nm wavelength field, this problem is avoidable. However, when the number of layers of a vacuum evaporationo film was made [many] not much, the routing accompanying vacuum evaporationo film formation increased, cost went up, and also there was a possibility that possibility that in accordance with time a vacuum evaporationo film will exfoliate from the substrate of the filter for fluorescence, and the filter for fluorescence will spoil a function might become high.
[0007] Let it be a technical problem to offer the fluorescence observation endoscope equipment which this invention can be made in view of the above-mentioned problem, can compare with a light filter with possible making only the light of a proper wavelength field penetrate even if it lessens the number of layers of the film formed in a substrate at the former, and can perform fluorescence observation of a body tissue proper.
[0008]
[Means for Solving the Problem] The following composition is used for this invention in order to solve the above-mentioned problem. That is, invention of a claim 1 is a light filter which makes only the light of a predetermined wavelength field penetrate, and is characterized by the bird clapper from the wavelength-selection transparency film formed at least in one side of the colored glass which makes a substrate, and the aforementioned colored glass.
[0009] Since according to invention of a claim 1 it is constituted when a light filter forms a wavelength-selection transparency membrane layer at least in one side of colored glass which makes a substrate, it can compare, when using white-board glass as a substrate, and the part light-transmission property of the grade which is the stage of colored glass can be given. For this reason, the number of layers of the wavelength-selection transparency membrane layer formed in colored glass can be lessened.
[0010] The light of the aforementioned predetermined wavelength field is good here also as a light of a 480nm - 590nm wavelength field (claim 2). However, the part light-transmission property of a light filter can be suitably set up according to the use of a light filter.

[0011] Moreover, you may constitute colored glass so that it may have the property which does not penetrate the light of a less than 400nm wavelength field (claim 3). However, the part light-transmission property of colored glass is not asked as long as a light filter will be in the state of holding a proper part light-transmission property, by forming a wavelength-selection transparency membrane layer in colored glass.
[0012] Moreover, the wavelength-selection transparency membrane layer may be formed with the single matter, and may be formed by two or more matter. Moreover, the formation method of a wavelength-selection transparency membrane layer is not asked as long as the light filter which has a proper part light-transmission property by this membrane layer formation is producible. For example, a wavelength-selection transparency membrane layer may be formed by vacuum evaporationo, may be formed by sputtering, and may be formed by dip coating.
[0013] Invention of a claim 4 is arranged in the lighting optical path between the body tissues which serve as a light source lamp made to generate lighting light and a photographic subject. It is arranged in the observation optical path between the observation sections for observing the filter for excitation light which penetrates only the excitation light of wavelength which generates fluorescence from the aforementioned body tissue among the aforementioned lighting light, and the aforementioned body tissue and its image. It is fluorescence observation endoscope equipment which has the filter for fluorescence which shades the aforementioned excitation light and penetrates the aforementioned fluorescence. This fluorescence observation endoscope equipment is characterized by the bird clapper from the wavelength-selection transparency membrane layer by which the filter for excitation light and/or the aforementioned filter for fluorescence are formed at least in one side of the colored glass which makes a substrate, and the aforementioned colored glass.
[0014]
[Embodiments of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to a drawing.
[Composition of fluorescence observation endoscope equipment] First, the fluorescence observation endoscope equipment by this operation gestalt is explained. Drawing 1 is the whole fluorescence observation endoscope equipment block diagram. In drawing 1 , the profile of the fluorescence observation endoscope equipment is carried out, it consists of an endoscope 10, the light source section 20, and the image pck-up section 30, and the monitor 50 is connected to the image pck-up section 30 through the video transfer device 40.
[0015] The endoscope 10 is equipped with the insertion section 11 in which a nose of cam makes the point of an endoscope 10, the control unit 12 by which the end was connected with the end face of the insertion section 11, and the light guide interconnecting tube 13 which extends from the peripheral face of a control unit 12. Eye contacting part 12a which connects an endoscope 10 and the image pck-up section 30 is prepared in the other end of this control unit 12. Moreover, connector 13a which connects an endoscope 10 and the light source section 20 is prepared in the end of the light guide interconnecting tube 13.
[0016] In the endoscope 10, the other end of a control unit 12 is covered from the nose of cam of the insertion section 11, and the image-guide fiber bundle (henceforth "IGFB") 14 is arranged. Moreover, at the nose of cam of the insertion section 11, an observation port 18 and the object optical system 15 as which the light which penetrated the observation port 18 is completed as a photographic subject's image in the incidence end face of IGFB14 are arranged.
[0017] Moreover, in eye contacting part 12a, the ocular 16 for observing the image injected from the injection end face of IGFB14 is arranged. However, when this ocular 16 connects the image pck-up section 30 to eye contacting part 12a, it moves to the position of ZERODIOPUTORI and carries out image formation of the image of the injection end face of IGFB14 by image formation optical-system 30a within the image pck-up section 30. Therefore, by the object optical system 15, image formation of the light which penetrated the observation port 18 is carried out as a photographic subject's image, it is transmitted to eye contacting part 12a through IGFB14, and is introduced into the image pck-up section 30 through an ocular 16.
[0018] Moreover, in the endoscope 10, the point of an endoscope 10 is covered from the end of connector 13a, and the light guide fiber bundle (henceforth "LGFB") 17 is arranged. The incidence end face of this LGFB17 is arranged towards the inside of the light source section 20 by connecting connector 13a to the light source section 20. On the other hand, the injection end face of LGFB17 is arranged in parallel with the object optical system 15 mentioned above. The luminous-intensity-distribution lens 19 is arranged ahead of the injection end face of this LGFB15. This luminous-intensity-distribution lens 19 extends the diameter of the flux of light of the lighting light from the injection end face of LGFB15, and illuminates the range of a photographic subject (image pck-up range) by which image formation is carried out to the incidence end face of IGFB14 with the object optical system 15.
[0019] The light source lamp 21 which used the xenon lamp is arranged in the position which counters the incidence end face of LGFB17 in the light source section 20. This light source lamp 21 emits the white light as a lighting light. With the reflecting mirror arranged back [the], it converges on the incidence end face of LGFB17, and incidence of the lighting light emitted from this light source lamp 21 is carried out.
[0020] The filter 22 for excitation light which penetrates the excitation light component (component with a wavelength of 380nm - 460nm) of fluorescence among the light emitted from the light source lamp 21 is arranged free [insertion and detachment] to the lighting optical path by the solenoid which is not illustrated at the lighting optical path between the light source lamp 21 and the incidence end face of LGFB17. That is, at the time of observation, it usually evacuates out of a lighting optical path, and the filter 22 for excitation light is inserted into a lighting optical path at the time of fluorescence observation. Incidence only of the excitation light is carried out to the incidence end face of LGFB17 at the time of fluorescence observation as a lighting light by this. When the body tissue from which this excitation light serves as a photographic subject irradiates, the fluorescence of a 480nm - about 600nm wavelength field is emitted from a body tissue.
[0021] In the image pck-up section 30, CCD camera 31 for observation is usually arranged at the position as for which the flux of light of image formation optical-system 30a carries out image formation. A photographic subject's usual observation image by which image formation was carried out with the ocular 16 is introduced into this CCD camera 31. Moreover, CCD camera 41 for fluorescence observation is arranged in the position parallel to CCD camera 31. These CCD cameras 31 and CCD cameras 41 are connected to the video transfer device 40, respectively.
[0022] Usually, between CCD camera 31 for observation, and the ocular 16, the reflective mirror 32 which bends the optical axis of an ocular 16 is installed free [insertion and detachment] by being inserted on the optical axis of an ocular 16. It is in the state where it usually evacuated from the optical path of the light which it is injected from an ocular 16 and carries out incidence to CCD camera 31 at the time of observation, predetermined angle-rotation-crosses at the angle of 45 degrees to the optical axis of an ocular 16 centering on the rotation shaft prepared in the edge by the side of an ocular 16 at the time of fluorescence observation, and this reflective mirror 32 bends the optical axis of an

ocular 16 at the angle of 90 degrees.
[0023] On the optical axis of the light bent by the reflective mirror 32, the filter 35 for fluorescence is arranged in the state of crossing perpendicularly to the optical axis. This filter 35 for fluorescence makes only a fluorescence component penetrate among the light bent by the reflective mirror 32.
[0024] Moreover, on the optical path of the light which penetrated the filter 35 for fluorescence, the reflective mirror 33 is arranged in the state of making the angle of 45 degrees to the optical axis of the light which penetrated the filter 35 for fluorescence. On the optical path of the light reflected by this reflective mirror 33, the image intensifier (henceforth "I-I") 34 which amplifies sharply the luminosity of the image which carried out image formation of the flux of light from an ocular 16 by image formation optical-system 33a is installed. The image by the fluorescence of the photographic subject with which the luminosity was amplified by this I-I34 is transmitted as a fluorescence observation image to CCD camera 41 for fluorescence observation arranged at the injection side of I-I34 by the image formation optical system which has been arranged between I-I34 and CCD camera 41 and which is not illustrated.
[0025] By image formation optical-system 30a, CCD camera 31 picturizes the usual observation image by which image formation was carried out, generates a video signal, and outputs this video signal to the video transfer device 40. Moreover, CCD camera 41 picturizes the fluorescence observation image transmitted from the image formation optical system which is not illustrated, generates a video signal, and outputs this video signal to the video signal transfer device 40.
[0026] The video transfer device 40 chooses either of the video signal inputted from CCD camera 31, and the video signal inputted from CCD camera 41, and transmits it to a monitor 50. A monitor 50 displays a photographic subject's picture (the usual observation image of a body tissue, or fluorescence observation image of a body tissue) on the screen based on the video signal inputted from the video transfer device 40.
[Composition of a light filter] Next, the composition of the light filter 22 in fluorescence observation endoscope equipment, i.e., the filter for excitation light, and the filter 35 for fluorescence is explained.
[0027] The filter 22 for excitation light consists of white-board glass which makes a substrate, and a vacuum evaporationo film formed in both sides of this white-board glass. The filters 35 for fluorescence differ in the filter 22 for excitation light, and consist of color sheet glass (equivalent to colored glass) which makes a substrate, and a vacuum evaporationo film (equivalent to a wavelength-selection transparency membrane layer) formed in both sides of this color sheet glass. The coloring matter glass of the tabular which does not penetrate the light of a wavelength field shorter than about 400nm light at all is used for color sheet glass.
[0028] Specifically, the color sheet glass of "Hoya L-42" by Hoya Corp. is used for the filter 35 for fluorescence as a substrate. This color sheet glass has the part light-transmission property which does not penetrate the light of a wavelength field shorter than about 410nm light at all, as shown in drawing 2 . moreover, the vacuum evaporationo film of the filter 35 for fluorescence consists of a vacuum evaporationo film of 175nm of thickness formed in one side of a substrate, and a vacuum evaporationo film of 113nm of thickness which the substrate was alike on the other hand, and was formed The vacuum evaporationo film formed in one side of a substrate consists of a film of 50 layers formed by carrying out the vacuum evaporationo of the matter of a refractive index 2.249, and the matter of a refractive index 1.489 by turns. moreover, the vacuum evaporationo film which the substrate was alike on the other hand, and was formed consists of a film of 47 layers formed by carrying out the vacuum evaporationo of the matter of a refractive index 2.249, and the matter of a refractive index 1.489 by turns
[0029] Drawing 3 is a graph which shows the part light-transmission property of the filter 22 for excitation light, and the filter 35 for fluorescence. As shown in drawing 3 , the filter 22 for excitation light penetrates only the light of a wavelength field shorter than about 460nm light. On the other hand, the filter 35 for fluorescence penetrates only the light of a 480nm - about 585nm wavelength field. Thus, the filter 22 for excitation light and the filter 35 for fluorescence have the composition that mutual transmitted wave length fields do not overlap at all. That is, the filter 35 for fluorescence has composition which penetrates only the light of the wavelength field of the fluorescence emitted by the living body, while shading completely the light which penetrated the filter 22 for excitation light.
[Operation of fluorescence observation endoscope equipment] Next, operation of fluorescence observation endoscope equipment is explained. As a premise of operation, the point (nose of cam of the insertion section 11) of an endoscope 10 shall be inserted in the living body, and it shall be arranged near the body tissue which should observe, and the power supply of the light source section 20 of fluorescence observation endoscope equipment, the image pck-up section 30, the video transfer device 40, and a monitor 50 shall be switched on.
[0030] Operation of the fluorescence observation endoscope equipment at the time of observation is usually explained to the beginning. Usually, when observing, the filter 22 for excitation light of the light source section 20 is made into the state where it evacuated out of the lighting optical path of the light source lamp 21. Moreover, it considers as the state where it evacuated, from the optical path of the light which the reflective mirror 32 of the image pck-up section 30 is injected from an ocular 16, and carries out incidence to CCD camera 31.
[0031] If lighting light (white light) is emitted from the light source lamp 21 by powering on of the light source section 20, the lighting light will be irradiated through LGFB17 and the luminous-intensity-distribution lens 19 by him at a body tissue. Then, an observation port 18 is penetrated, by the object optical system 15, image formation of the reflected light from a body tissue is usually carried out as an observation image, and it is introduced in the image pck-up section 30 through IGFB14, an ocular 16, and image formation optical-system 30a. Within the image pck-up section 30, the usual observation image in which image formation was carried out by image formation optical-system 30a is usually picturized by CCD camera 31 for observation, is changed into a video signal, and is outputted to the video transfer device 40. This video signal is transmitted to a monitor 50 with the video transfer device 40. And a living body's usual observation image is displayed on the screen of a monitor 50.
[0032] Next, operation of the fluorescence observation endoscope equipment at the time of fluorescence observation is explained. When performing fluorescence observation, the filter 22 for excitation light of the light source section 20 is made into the state where it was inserted in the lighting optical path of the light source lamp 21. Moreover, the reflective mirror 32 of the image pck-up section 30 is made into the state of crossing at the angle of 45 degrees to the optical axis of an ocular 16.
[0033] If lighting light (white light) is emitted from the light source lamp 21 by powering on of the light source section 20, the lighting light will be irradiated by him by the filter 22 for excitation light. Then, the filter 22 for excitation light makes only the light (excitation light) of the wavelength field shorter than about 460nm light among the white lights penetrate. Incidence of this excitation light is carried out to the incidence end face of LGFB13, and it is irradiated by the body tissue through the luminous-intensity-distribution lens 19 through the inside of LGFB17. The fluorescence of a 480nm -

about 600nm wavelength field is emitted from a body tissue by this.
[0034] At this time, the fluorescence emitted from the body tissue and the reflected light of the excitation light irradiated to the body tissue will be in the state of carrying out incidence at an observation port 18. That is, by the object optical system 15, image formation of the image of a body tissue which consists of excitation light and fluorescence is carried out, and it is transmitted to eye contacting part 12a through IGFB14. And the light injected from each point of the injection end face of IGFB14 is introduced into the image pck-up section 30 through an ocular 16.
[0035] Within the image pck-up section 30, it is reflected by the reflective mirror 32 and incidence of the light injected from the ocular 16 is carried out to the filter 35 for fluorescence. The filter 35 for fluorescence makes only the light of a 480nm - about 585nm wavelength field penetrate among the light which carried out incidence. That is, an excitation light component is removed. Then, it is reflected by the reflective mirror 33 and the fluorescence observation image image formation was carried out [the image] by image formation optical-system 33a carries out incidence of the light which penetrated the filter 35 for fluorescence, i.e., the fluorescence, to the plane of incidence of I-I34. Within I-I34, the fluorescence observation image formed of image formation optical-system 33a is amplified, and is transmitted to CCD camera 41 for fluorescence observation through the image formation optical system which is not illustrated.
[0036] The fluorescence observation image transmitted to CCD camera 41 is picturized by this CCD camera 41, is changed into a video signal, and is outputted to the video transfer device 40. The video transfer device 40 transmits the video signal inputted from CCD camera 41 to a monitor 50. A monitor 50 displays a living body's fluorescence observation image on the screen based on the inputted video signal.
[0037] Since the fluorescence observation image displayed on a monitor 50 at this time consists of only fluorescence components in the 480nm - about 585nm wavelength field which penetrated the filter 35 for fluorescence and does not contain the excitation light component at all, it is a bright clear image. Therefore, the observer of a monitor 50 can diagnose the existence of a living body's disease etc. proper.
[Effect of an operation form] Since according to this operation form it is produced when the fluorescence filter 35 forms a vacuum evaporationo film in a color sheet glass substrate, light of a wavelength field shorter than the light which is about 480nm which the conventional filter for fluorescence (refer to drawing 4) makes penetrate is not made to completely penetrate. Therefore, the filter 35 for fluorescence can shade completely the excitation light which penetrated the filter 22 for excitation light, and can make only the fluorescence emitted from a living body penetrate. Therefore, the fluorescence observation endoscope equipment by this operation form can display on the screen of a monitor 50 the proper fluorescence observation image which consists only of a fluorescence component.
[0038] Moreover, the filter 35 for fluorescence by this operation form is produced using the color sheet glass which has a part light-transmission property near the part light-transmission property which the completed filter for fluorescence should have. For this reason, the light (refer to drawing 4) of wavelength shorter than the about 370nm light made to penetrate when the filter for fluorescence was produced using a white-board glass substrate can be shaded completely. For this reason, only the number of layers required in order to make rapid the standup of the part light-transmission property of the filter 35 for fluorescence is sufficient for the number of layers of a vacuum evaporationo film. That is, a vacuum evaporationo film can be formed by the few number of layers. Therefore, the increase in a routing and the rise of cost concerning vacuum evaporationo film formation can be suppressed. Moreover, possibility that a vacuum evaporationo film will exfoliate from the substrate of the filter for fluorescence can also be stopped.
[0039] In addition, although the color sheet glass of "Hoya L-42" was used for the substrate of the filter 35 for fluorescence of this operation form, "Y-44" by Hoya Corp. and "Y-46" may be used for color sheet glass. The part light-transmission property of these color sheet glass of "Y-44" and "Y-46" is shown in drawing 4 . However, in producing the filter 35 for fluorescence using "Y-44" or "Y-46", according to a light-transmission property, it forms a vacuum evaporationo film that much.
[0040] Moreover, with this operation form, although the filter 35 for fluorescence of fluorescence observation endoscope equipment was explained, the light filter by this invention is not restricted to this operation form. For example, it may be produced when the filter 22 for excitation light forms a vacuum evaporationo film in color sheet glass. In this case, it is more desirable than about 460nm light as a colored-glass substrate to use the color sheet glass which does not penetrate the light of a long wave length field. In addition, the light filter of this invention can be carried out widely as the light filter which constitutes an optical instrument, a band pass filter, etc.
[0041] Moreover, the transmitted wave length field of a light filter can be suitably set up according to the use of a light filter. Moreover, as long as the completed light filter becomes what has the part light-transmission property meant before the production, the number of layers of the part light-transmission property of a color sheet glass substrate and the quality of the material of a vacuum evaporationo film, a kind, and a film etc. can be set up suitably. Moreover, the light filter could be produced by forming a vacuum evaporationo film only in one side of colored glass.
[0042]
[Effect of the Invention] Even if it lessens the number of layers of the film formed in a substrate, only the light of a proper wavelength field can be made to penetrate according to the light filter by this invention. Moreover, according to the fluorescence observation endoscope equipment by this invention, it can compare with the former and fluorescence observation of a body tissue can be performed proper.

[Translation done.]

* NOTICES *

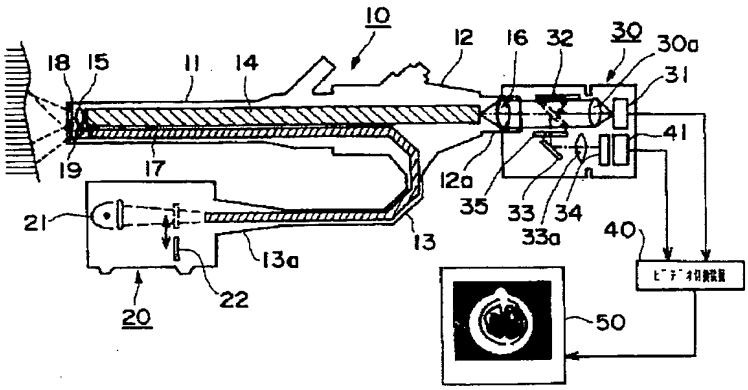
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The whole fluorescence observation endoscope equipment block diagram by this operation gestalt
[Drawing 2] The graph which shows the part light-transmission property of the color sheet glass which constitutes the filter for fluorescence shown in drawing 1
[Drawing 3] The graph which shows the part light-transmission property of the filter for excitation light shown in drawing 1 , and the filter for fluorescence
[Drawing 4] The graph which shows the part light-transmission property of color sheet glass of making the modification of this operation gestalt
[Drawing 5] The graph which shows the part light-transmission property of the conventional filter for excitation light, and the filter for fluorescence
[Description of Notations]
18 Filter for Fluorescence
22 Filter for Excitation Light

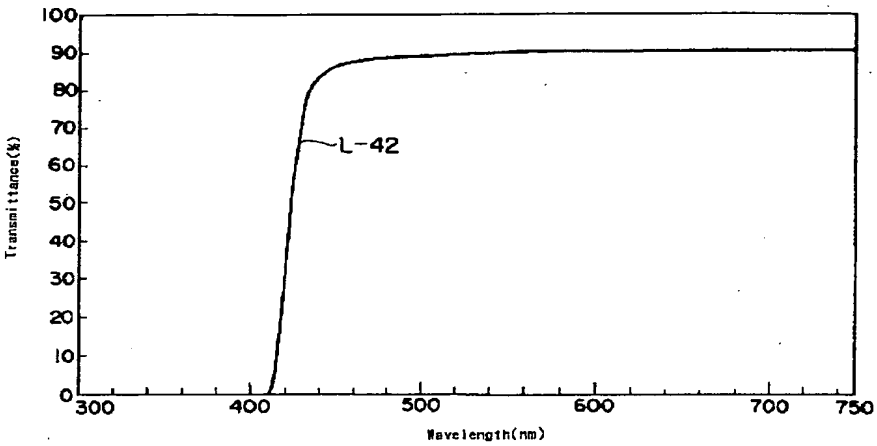
[Translation done.]

Drawing selection drawing 1



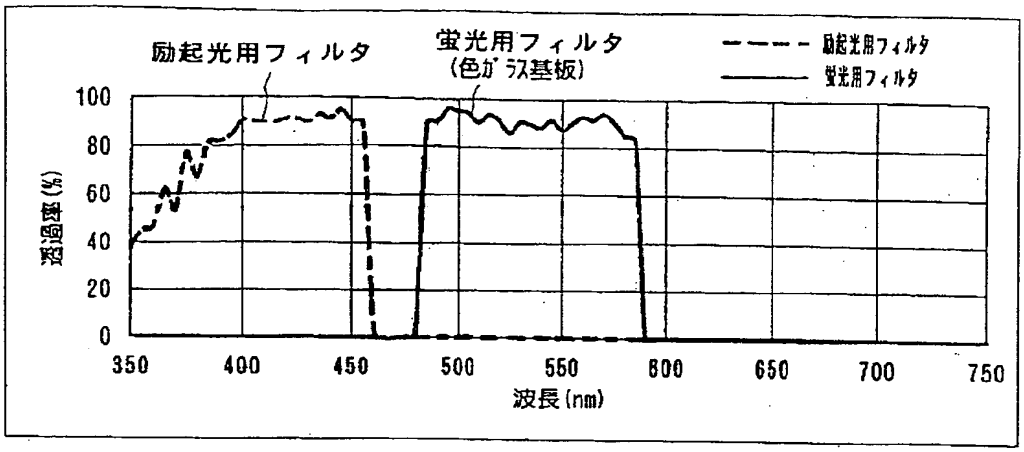
[Translation done.]

Drawing selection drawing 2



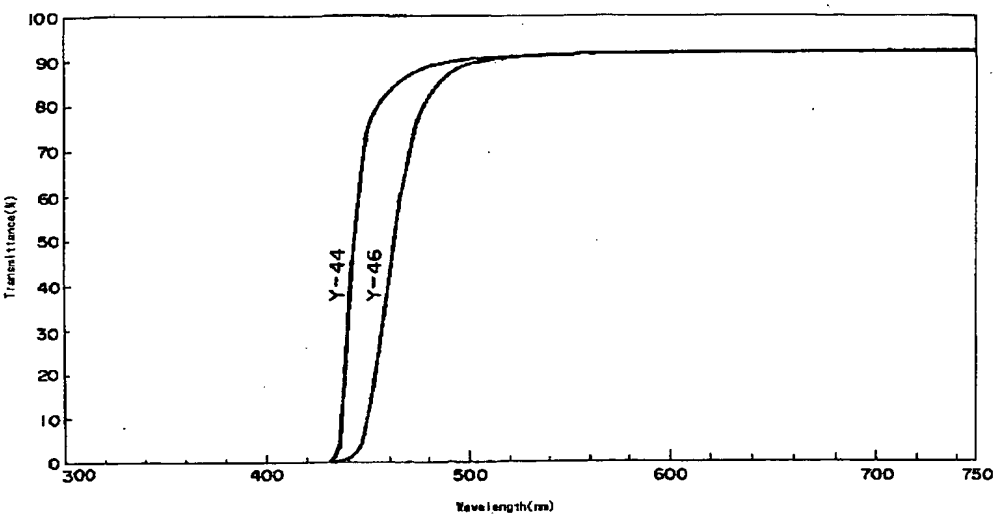
[Translation done.]

Drawing selection drawing 3



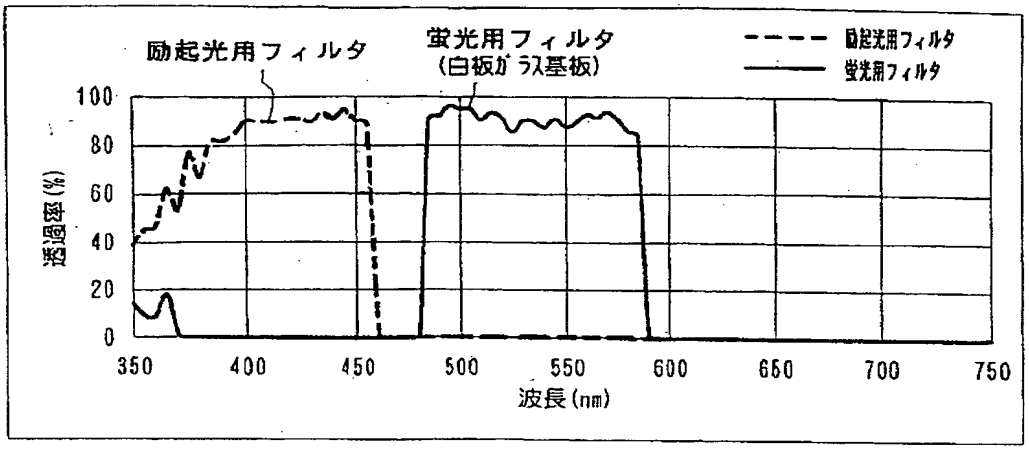
[Translation done.]

Drawing selection drawing 4



[Translation done.]

Drawing selection drawing 5



[Translation done.]